

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of

Promoting Investment in the 3550-3700 MHz
Band

GN Docket No. 17-258

REPLY COMMENTS OF GOOGLE LLC

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INTRODUCTION AND SUMMARY

The record developed in response to the Commission’s Notice of Proposed Rulemaking (“NPRM”)¹ highlights several opportunities to improve the utility of the 3.5 GHz band. There is widespread agreement that the Commission could grant several of the large carriers’ proposals *without excluding other potential operators or stranding investment* by: 1) adjusting out-of-band-emissions limits for compatibility with emerging 5G standards; 2) eliminating the existing mutual exclusivity requirement for issuing a Priority Access License (“PAL”); and 3) facilitating secondary-market transactions. Google supports these changes.

The record also leaves no doubt, however, that two changes sought by large carriers would undermine the Commission’s stated goals for the band by denying potential bidders—including rural broadband providers, electric utilities, factory owners, industrial Internet of Things (“IIoT”) service providers, venue operators, and others—any realistic opportunity to make economically viable use of PALs. Both expanding PALs to cover entire Partial Economic Areas (“PEAs”) and making PAL lengths effectively perpetual through ten-year renewable terms would limit participation in the 3.5 GHz PAL auction to a small handful of large incumbents. Dozens of commenters that are outside this select group uniformly state that they cannot successfully bid on licenses covering geographic areas and governed by terms that are appropriate only for large wireless carriers. Moreover, numerous commenters—ranging from small rural broadband providers to large IIoT providers—have highlighted the significant investments they have already made in reliance on the existing rules, and which they stand to lose if the rules are substantially revised. These investments, as well as the future of the 3.5 GHz

¹ *Promoting Investment in the 3550-3700 MHz Band et al.*, Notice of Proposed Rulemaking and Order Terminating Petitions, FCC 17-134, 32 FCC Rcd. 8071 (2017) (“NPRM”).

band as an “opportunity band” that can support the full potential of 5G networks, hang in the balance in this proceeding.

Finally, the Commission should not conceal from public view all Citizens Broadband Radio Service Device (“CBSD”) registration data. This rule change would provide little or no additional protection for PAL holders’ competitively sensitive information, and yet it would deny General Authorized Access (“GAA”) users information they need to plan potential CBRS systems.

DISCUSSION

I. THE RECORD SUPPORTS SEVERAL CHANGES TO THE CBRS RULES TO SUPPORT WIDESPREAD DEPLOYMENTS IN RURAL AND URBAN AREAS.

Substantially increasing PAL size or lengthening license terms would disrupt investment in the CBRS band by all but the largest mobile carriers. Consequently, these proposals have drawn nearly uniform record opposition. Other proposed changes, however, could make the band more hospitable for large carriers’ deployments while still supporting investment and deployment by other types of PAL bidders and GAA operators. The Commission can improve its Part 96 rules by making these revisions.

First, as T-Mobile,² Verizon,³ and other carriers observe, the existing 3.5 GHz emissions mask may unnecessarily limit carrier services. Although the existing emissions limits were

² Comments of T-Mobile USA, Inc. at 18, GN Docket No. 17-258 (filed Dec. 28, 2017) (“T-Mobile Comments”).

³ Comments of Verizon at 17, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Verizon Comments”).

designed to prevent interference between 10 or 20 MHz-wide 3.5 GHz channels,⁴ T-Mobile explains that “[w]ider bandwidths will be critical for 5G operations.”⁵ The existing out-of-band-emissions mask may require a significant power reduction to enable these wider bandwidth operations, reducing “signal coverage, quality of service, and general utility of the band.”⁶ Google agrees that the Commission may increase these limits without increasing the risk of harmful interference between adjacent-channel CBSDs and has therefore supported relaxation of the out-of-band-emissions mask to ensure compatibility with emerging 5G standards.⁷

The Commission also should adopt its proposal to eliminate the rule restricting the number of available PALs such that there are fewer PALs than there are bidders. Carriers have raised concerns about this approach, including that it could result in a carrier with an existing PAL being unable to obtain a new one when its license expires, even if it valued that spectrum highly enough to prevail in a PAL auction. As AT&T argued, “[t]his approach breeds uncertainty, hindering investment and innovation and ultimately impeding the deployment of innovative services.”⁸ Altering this rule would address large carriers’ concerns without undermining investment in CBRS deployments or precluding access by other users.⁹

⁴ *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Order on Reconsideration and Second Report and Order, FCC 16-55, 31 FCC Rcd. 5011, 5036-38 ¶¶ 91-98 (2016).

⁵ T-Mobile Comments at 18.

⁶ Verizon Comments at 17.

⁷ See Letter from Austin C. Schlick, Director, Communications Law, Google Inc., to Marlene H. Dortch, Secretary, FCC, Attachment at 5, GN Docket No. 12-354 (filed Apr. 22, 2016).

⁸ Comments of AT&T Services, Inc. at 10, GN Docket No. 17-258 (filed Dec. 28, 2017) (“AT&T Comments”).

⁹ See also Comments of Google Inc. at 17, GN Docket No. 12-354 (filed Dec. 5, 2013) (“While the Commission may need to use an auction mechanism to assign Priority Access rights⁴⁹ in some circumstances, it should turn to auctions only where mutual exclusivity cannot be avoided in a manner more consistent with low-cost entry into the band”).

Finally, there is virtually universal support on the record for improving secondary-market rules for 3.5 GHz PALs. Although (as discussed below) secondary-market transactions will not provide a meaningful opportunity for small providers to acquire disaggregated PAL spectrum from large carriers, these deals could be a useful tool for large carriers to expand their PAL footprints between auctions. For example, Google’s opening comments provide a map of a potential CBSD deployment at Madison Square Garden.¹⁰ Although that deployment would cover portions of six census tracts, it would also leave much of that area—which may be extremely valuable to another licensee, such as a large carrier—available for other uses. Partitioning census-tract-sized PALs could be useful in such situations, where consumer demand for wireless services is high and a variety of business models could be economically viable.

II. THE RECORD LEAVES NO DOUBT THAT SUBSTANTIALLY INCREASING THE SIZE OR DURATION OF PALs WOULD UNDERMINE HETEROGENEOUS 5G DEPLOYMENTS AND PRACTICALLY RESERVE PALs FOR A SMALL NUMBER OF FAVORED COMPANIES.

Comments in response to the Commission’s NPRM demonstrate overwhelming and growing opposition to the large carriers’ proposals to dramatically expand PAL license areas and convert limited-duration PAL terms to essentially permanent grants of spectrum rights. These changes may be more advantageous for the specific business models large carriers have at the moment, but they are fundamentally incompatible with the business models of virtually any other type of prospective PAL licensee and leave little room for evolving uses even by major mobile carriers themselves.

¹⁰ Comments of Google LLC at 11, fig.6., GN Docket No. 17-258 (filed Dec. 28, 2017) (“Google Comments”).

A. The Record Confirms Uniform Opposition to PEA-Sized PALs—Except Among Large Carriers and Their Suppliers.

Of the 192 comments submitted in response to the Commission’s NPRM, only a few large carriers and a handful of their major suppliers supported the carriers’ proposed expansion of PAL license areas. The overwhelming majority of commenters—large industrial companies, local broadband providers, technology companies, and local governments—oppose this change, and are supported by submissions from two of the nation’s leading spectrum economists: Dr. Paul Milgrom of Stanford University and Dr. William Lehr of MIT.¹¹ Even Dr. Daniel Vincent, who prepared an economic analysis on behalf of Verizon, declined to opine on Verizon’s own proposal to adopt PEA boundaries.¹² For the Commission to adopt a proposal that has been almost uniformly opposed and thoroughly discredited, and is not supported even by the large carriers’ own submissions, would be arbitrary and capricious.

¹¹ See William Lehr, *Analysis of Proposed Modification to CBRS PAL Framework*, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Lehr Comments”); Letter from Paul Milgrom, Auctionomics, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 12-354 (filed Aug. 7, 2017) (“Milgrom Comments”).

¹² See Daniel R. Vincent, *Secondary Markets, License Terms and Priority Access Licenses* 6, GN Docket No. 17-258 (filed Dec. 29, 2017) (“Vincent Comments”) (“I have no expertise over engineering aspects of the telecom industry that might determine the optimal partition for spectrum broadly or for the PALs licenses more narrowly so I do not presume to opine on the ideal partition size”). Dr. Vincent goes on to argue that, if the license size is too small, and carriers do not value PAL licenses individually, hold-out problems may prevent carriers from accumulating PALs on the secondary market and aggregating them into the larger areas they desire. However, both the premise and the conclusion of this argument are incorrect as applied to the 3.5 GHz band. First, Dr. Vincent overlooks that there will be several PALs available in any given location, in addition to GAA spectrum, eliminating the possibility that there will ever be a single “last trader” who is positioned to capture a disproportionate share of the gains from trade, without competition from other potential sellers. Second, a typical CBSD deployment is significantly smaller than a census tract, meaning that a large carrier could increase network capacity, and therefore derive significant value from, a single PAL under the existing rules regardless of whether it controlled PALs throughout the rest of the market. As Dr. Paul Milgrom concluded, “Given the licensing structure of the 3.5GHz band, complementarities also play a relatively minor role.” Milgrom Comments ¶ 17.

The record unequivocally demonstrates that PEA-sized license areas are incompatible with the business models of every potential user of 3.5 GHz PALs, other than large carriers.¹³

¹³ See Comments of AirLink Internet Services at 1, GN Docket No. 17-258 (filed Dec. 27, 2017) (“AirLink Comments”) (“[I]t wouldn’t be financially possible to participate in the auction.”); Comments of Airosurf Communications, Inc. at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Partial Economic Areas would effectively price companies like Airosurf . . . out of the market.”); Comments of Tanner Bender, BDA Wireless, LLC at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (“BDA Wireless Comments”) (“Changing the units of land mass to PEAs from Census Tracts will be far too costly for my employer to acquire the licenses.”); Comments of BPS Networks at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (“BPS Networks Comments”) (“Changing the PAL’s from census tract size to PEA’s and increasing the license term to ten years will drive the cost of the licenses to a level that small providers cannot afford or be able to justify.”); Comments of Cal.net, Inc. at 2, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Enlarging the PALs license service areas from Census tract size . . . would put the price of PALs out of our reach.”); Comments of CTIconnect, LLC at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Operators simply will not be able to afford licenses based on larger geographic areas”); Comments of Cyber Broadband Inc at 2, GN Docket No. 17-258 (filed Dec. 28, 2017) (“By using larger license areas, *you will price us out of the market!!*”) (emphasis in original); Comments of DMCI Broadband, LLC at 1, GN Docket No. 17-258 (filed Dec. 27, 2017) (“These changes would all but eliminate the smaller companies in favor of the large telco’s.”) (“DMCI Broadband Comments”); Comments of DSLbyAir, Inc. at 1, GN Docket No. 17-258 (filed Dec. 26, 2017) (“DSLbyAir Comments”) (“Expanding the PALs to areas greater than the census tracts would make it impossible to make a competitive bid at the PAL auction”); Comments of Eastern Oregon Net, Inc. at 2, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Such a change would foreclose availability of access to PALs; a small company such as ourselves simply could not afford to participate.”); Comments of e-vergent.com, LLC at 2, GN Docket No. 17-258 (filed Dec. 26, 2017) (“We would only deploy a network in a handful of the rural census tracts of each PEA making it much too costly for us.”); Comments of Grand County Internet Services Inc. at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (“[I]t would be impossible to bid in auction for the PEA area.”); Comments of In the Stix Broadband at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Partial Economic Areas will make it impossible for us to compete for the licenses.”); Comments of Link Technologies, Inc. at 3, GN Docket No. 17-258 (filed Dec. 28, 2017) (“[M]any of our clients, small businesses, will not have the funding to attempt to get PALs with such a large area.”); Comments of New Lisbon Telephone Company, Inc. at 1, GN Docket No. 17-258 (filed Dec. 22, 2017) (“It will be impossible for NLBC to make a competitive bid on that large of a territory.”); Comments of Pearl Creek Broadband LLC at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (“We all know that using PEAs will price small rural providers out of the upcoming license auction.”); Comments of Portative Technologies, LLC at 1, GN Docket No. 17-258 (filed Dec. 29, 2017) (“Changes to the CBRS auction rules to increase the size of PALs to PEAs would make it impossible for Portative to acquire any license.”); Comments of Q-Wireless, LLC at 1, GN Docket No. 17-258 (filed Dec. 27, 2017) (“Q-Wireless Comments”) (“This [proposal]

will effectively price providers of our size out of the market.”); Comments of Rocket Communications Corp. at 2, GN Docket No. 17-258 (filed Dec. 28, 2017) (“The proposed [sic] changes to increase the PAL area from census tracts to PEAs would effectively force us not to participate in PAL auctions.”); Comments of Shelby Broadband at 1, GN Docket No. 17-258 (filed Dec. 27, 2017) (“A change in the CBRS auction rules to increase the size of PALs to PEAs would make it virtually impossible for Shelby Broadband to acquire any licenses.”); Comments of SmartBurst LLC at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (“The proposed rule changes would make the cost of acquiring protected Priority Access Licenses (PALs) through auction significantly higher, pricing out many small would-be bidders”); Comments of Verso Networks at 1, GN Docket No. 17-258 (filed Dec. 27, 2017) (“Verso Networks Comments”) (“These proposals make it economically infeasible for small companies to make competitive bids at the PAL auction”); Comments of Vertical Broadband, LLC at 4, GN Docket No. 17-258 (filed Dec. 21, 2017) (“Basing PAL auctions solely on PEAs rather than census tracts would *wholly prevent* us from bidding on our existing domain.”) *see also* Comments of Amplex Electric, Inc. at 1, GN Docket No. 17-258 (filed Dec. 27, 2017) (explaining that it would be cost prohibitive to bid on the PEAs needed to cover its existing network area) (“Amplex Electric Comments”); Comments of Baicells Technologies North America at 4, GN Docket No. 17-258 (filed Dec. 27, 2017) (same); Comments of Bolt Internet Inc. at 1, GN Docket No. 17-258 (filed Dec. 27, 2017) (same); Comments of Broadband Corp at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (same); Comments of Cirrinity Wireless, LLC at 2, GN Docket No. 17-258 (filed Dec. 29, 2017) (“Cirrinity Wireless Comments”) (same); Comments of Express Dial Internet, Inc. dba KWISP Internet at 4, GN Docket No. 17-258 (filed Dec. 28, 2017) (“KWISP Internet Comments”) (same); Comments of InfoWest, Inc at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (same); Comments of Intelligent Computing Solutions at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (same); Comments of The Junction Internet LLC at 1-2, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Junction Internet Comments”) (same); Comments of Kentucky Wimax at 2, GN Docket No. 17-258 (filed Dec. 26, 2017) (same); Comments of New Wave Net Corp. at 1-2, GN Docket No. 17-258 (filed Dec. 28, 2017) (same) (“New Wave Net Corp. Comments”); Comments of OnlineNW at 2, GN Docket No. 17-258 (filed Dec. 28, 2017) (“OnlineNW Comments”) (same); Comments of On-Ramp Indiana, Inc. at 1, GN Docket No. 17-258 (filed Dec. 26, 2017) (same); Comments of Ridgetop Networks, LLC at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (same) Comments of Royell Communications, Inc. at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (same); Comments of Rural Broadband Network Services dba HighSpeedLink.net at 6, GN Docket No. 17-258 (filed Dec. 27, 2017) (“HighSpeedLink.net Comments”) (same); Comments of Sandhills Wireless, LLC at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (same); Comments of Smart Way Communications, LLC at 1, GN Docket No. 17-258 (filed Dec. 27, 2017) (“Smart Way Communications Comments”) (same); Comments of Softcom Internet Communications, Inc. at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Softcom Internet Comments”) (same); Comments of Southern Internet, Inc. at 3, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Southern Internet Comments”) (same); Comments of Virginia Everywhere, LLC dba All Points Broadband at 2, GN Docket No. 17-258 (filed Dec. 28, 2017) (“All Points Broadband Comments”) (same); Comments of Wonderlink Communications at 1-2, GN Docket No. 17-258 (filed Dec. 28, 2107) (same).

The General Electric Company (“GE”), for example, describes several specific use cases, such as downloading aircraft sensor data at airports, deploying a private LTE network to collect sensor data and video from across an oil field, or securely connecting devices within a hospital setting,¹⁴ each of which would require high-speed connectivity and interference protection, but would often cover less than even a single census tract, much less a PEA.¹⁵ Dramatically expanding PAL license areas would frustrate these plans: “While GE and its customers would compete vigorously in auctions for *census-tract* licenses, it would not be economically rational to outbid established wireless carriers for PEA licenses covering territory extending far beyond their geographically targeted, localized wireless network deployments.”¹⁶

Likewise, Rajant Corporation (“Rajant”) detailed its existing services which provide broadband within entertainment and other venues, and also are used “across a broad array of industries, including military, industrial, transportation, utilities, telecommunications, and all levels of government for public safety and other mission critical applications.”¹⁷ Rajant has already deployed these services in reliance on the Commission’s current 3.5 GHz rules but they would become unsustainable with PEA-sized PALs¹⁸

Numerous commenters have explained the significant harm that PAL expansion would cause to rural broadband connectivity. For example, Arbuckle Communications, LLC (“Arbuckle”) submitted comments describing its use of the 3.5 GHz band to deliver high-speed

¹⁴ Comments of the General Electric Company at 14-15, GN Docket No. 17-258 (filed Dec. 28, 2017) (“GE Comments”).

¹⁵ *See id.* at 22 n.36.

¹⁶ *Id.* at 22.

¹⁷ Comments of Rajant Corporation at 2, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Rajant Comments”).

¹⁸ *Id.*

internet access to homes and businesses in rural Oklahoma, and their plans to bid for PAL spectrum to support still higher speeds, provided the current census-tract framework is not changed.¹⁹

CBRS spectrum is not only essential for IIoT and rural areas; it plays a crucial role in connecting underserved urban communities as well. As comments by the City of New York, Next Century Cities,²⁰ and wireless broadband providers illustrate,²¹ the carriers' proposals "risk leaving already underserved communities without the benefits of 5G"²² if, due to these changes, smaller entities are discouraged or precluded from acquiring PALs for targeted local deployments.

In fact, the record now makes clear that expanding PAL license areas to PEAs is incompatible even with the business models of smaller incumbent wireless carriers. As Alaska Communications points out, PEAs are larger than the footprints of many smaller operators, meaning that, even among cellular providers, "it is highly likely that only part of any PEA will be of value to a potential bidder."²³ Although Alaska Communications focuses on the large size of PEAs in Alaska, the mismatch between PEAs and the footprints of local cellular providers is common throughout the United States.²⁴

¹⁹ Comments of Arbuckle Communications, LLC at 3, GN Docket No. 17-258 (filed Dec. 27, 2017) ("Arbuckle Comments").

²⁰ Comments of Next Century Cities at 2-3, GN Docket No. 17-258 (filed Dec. 28, 2017).

²¹ *See, e.g.*, HighSpeedLink.net Comments at 12-13 (highlighting the importance of wireless broadband service in underserved areas of Washington, D.C.).

²² Comments of the City of New York at 1, GN Docket No. 17-258 (filed Dec. 28, 2017).

²³ Comments of Alaska Communications at 6, GN Docket No. 17-258 (filed Dec. 28, 2017).

²⁴ For example, WUE, Inc. ("WUE"), a wireless provider in Southeast Nevada, holds spectrum only in CMA 257, which overlaps two significantly larger PEAs. If WUE sought to cover its existing footprint using PAL spectrum under the carriers' proposal, it would need to acquire the much larger area that comprises both of those PEAs, and includes Reno, NV. The same is

These comments, and the scores of other comments filed in opposition to the large carriers' proposals, confirm Dr. William Lehr's analysis that:

The suggested change to expand PAL license territories to the size of Partial Economic Areas ("PEAs") would effectively foreclose a large number of potential users of CBRS spectrum that might otherwise be interested in taking advantage of the CBRS spectrum to deploy wireless networks that support coverage (for services such as rural broadband) and localized private LTE networks for quality of service (for services such as IIoT).²⁵

The large carriers argue that PEA-sized PALs better match their usual patterns of deployment. However, the average PEA is more than 1,000 times larger than a typical high-power CBSD.²⁶ Thus, larger license areas are clearly not necessary to allow individual CBSD deployments. The existing rules also do not preclude large carriers from obtaining the broad coverage areas in the 3.5 GHz band if that is more efficient for them. As T-Mobile concedes, carriers will be able to combine census tracts to obtain the license area that best suits their deployment plans.²⁷ In fact, unlike a PEA-based framework, the existing rules will allow carriers to obtain precisely the spectrum they need, without forcing them to acquire spectrum they do not need in order to provide service.

Indeed, the large carriers' opposition to meaningful build-out requirements for 3.5 GHz PALs confirms that they intend to cover only a fraction of the typical PEA. T-Mobile, for instance, rejects geographic build-out requirements as "incompatible with small-cell

true of Mid-Rivers Telephone Cooperative, Inc. ("Mid-Rivers"), which holds spectrum licenses covering CMA 268. That CMA covers only Billings, MT and the surrounding Yellowstone County. To cover that area under the large carriers' proposal would require Mid-Rivers to bid on and win two PEAs, each of which is several times larger than the company's existing coverage area.

²⁵ Lehr Comments at 11.

²⁶ Google Comments at 10-11, figs.1-6.

²⁷ T-Mobile Comments at 9.

deployment”²⁸ that is aimed at increasing capacity rather than coverage.²⁹ T-Mobile coyly writes that “at least some of the applications for the 3.5 GHz band will be focused on small-cell deployment and may be used to enhance capacity,”³⁰ but the Commission has recognized that small-cell deployments will be the typical 3.5 GHz use case for mobile carriers: T-Mobile’s “some” actually means “most.”³¹ T-Mobile’s proposal of a build-out requirement of only 40% of the population of a license area³² could be met by covering only a small fraction of a license’s geographic area. Other carriers ask the Commission to refrain from imposing any specific build-out requirement. AT&T, for example, asks the Commission not to impose any “rigorous” performance requirements and instead to require merely “substantial service.”³³ CTIA goes a step further still and urges the Commission not to impose any performance requirements at all.³⁴

These arguments highlight the fundamental flaw of adopting PEA-sized PAL areas for this particular band: CBRS spectrum will be used to add network capacity, and carriers likely will not use it to cover more than a fraction of a PEA, leaving the remainder entirely unserved by PAL-based services. In fact, PEAs often are larger than the license areas the Commission has designated for other spectrum that is useful for wide-area macrocell coverage. For carriers’ core 700 MHz spectrum, for example, the license area covering New York City, CMA 1, is less than a

²⁸ *Id.* at 7.

²⁹ *Id.* at 6-7.

³⁰ *Id.* at 6.

³¹ *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Report and Order and Second Further Notice of Proposed Rulemaking, FCC 15-47, 30 FCC Rcd. 3959, 3961 ¶ 1 (2015) (“3.5 GHz Order”).

³² *Compare, e.g.*, 47 C.F.R. § 27.14(q)(2) (imposing a final build out requirement of 70% of the population of the license area in the AWS-4 band).

³³ AT&T Comments at 13-14.

³⁴ Comments of CTIA at 7, GN Docket No. 17-258 (filed Dec. 28, 2017) (“CTIA Comments”).

quarter of the size of the PEA covering the New York City area. BTA-licensed PCS spectrum demonstrates a similar mismatch, where BTA 321, which covers New York City, is twice as large as the corresponding PEA.³⁵ These absurd outcomes confirm the irrationality of choosing large PEA license areas for small cell deployments in 3.5 GHz spectrum.

The solution to this problem is not to adopt watered-down build-out requirements that surely will leave large parts of every license area with no licensed CBRS service. The solution is also not strong, but hard-to-enforce, build-out rules that attempt to correct for oversized PALs through regulatory fiat. The record leaves no doubt that many potential PAL bidders want to cover these areas without a government regulation requiring them to do so—but they cannot make use of licenses that cover areas that are far bigger than their service areas. Keeping census-tract-sized license areas will give *both* large carriers *and* geographically focused providers access to PALs and allow the market rather than build-out regulations to incentivize investment.

The large carriers’ other arguments in favor of PEA-sized license areas primarily revolve around administrability. But implementation of the 2015 Part 96 rules is already well down the road, without the emergence of any major obstacles. For example, although the large carriers have argued SASs are not up to the job of coordinating operations in a large number of license areas,³⁶ SAS providers, in reliance on the existing rules, have developed SASs that are more than

³⁵ Other markets exhibit a similar pattern. In Los Angeles, PEA 2 is significantly larger than both the CMA and BTA covering that city.

³⁶ See Petition for Rulemaking to Amend the Commission’s Rules Regarding the Citizens Broadband Radio Service in the 3550-3700 MHz Band, Petition for Rulemaking, GN Docket No. 12-354 at 9 (filed June 16, 2017); CTIA Comments at 8 (claiming that census-tract licenses will be “burdensome . . . to administer and manage”).

capable of supporting the existing PAL license areas. In fact, by agreeing to serve as SAS providers they committed to do just that.³⁷

Arguments about reducing cross-border interference are similarly meritless. Prevention of cross-border interference is a core function of the SASs, and carriers have provided no record evidence to support reversal of the Commission conclusion that SAS providers can perform this function reliably.³⁸ The cross-border interference argument is also inconsistent with carriers' own assertions that 3.5 GHz spectrum will only be attractive for large-carrier investment if they are able to aggregate numerous geographically contiguous PALs.³⁹ License-border interference issues are a concern only if adjacent PALs are held by different licensees. If carriers cover large, contiguous geographic regions, that will greatly reduce the number of areas where interference would have to be managed across a license border. The existing rules reinforce this by requiring SAS providers, whenever possible, to "assign geographically contiguous PALs held by the same Priority Access Licensee to the same channels in each geographic area."⁴⁰ In fact, AT&T itself proposed such an approach in 2014, arguing that it would "minimize the need for border coordination."⁴¹

The large carriers' argument that the existing license size makes PAL auctions technically infeasible is also unfounded.⁴² Notably, moreover, these same companies made no

³⁷ 3.5 GHz Order ¶¶ 353, 356; 47 C.F.R. § 96.63.

³⁸ See 3.5 GHz Order ¶¶ 311-315.

³⁹ See, e.g., T-Mobile Comments at 9.

⁴⁰ 47 C.F.R. § 96.59(b).

⁴¹ Reply Comments of AT&T at 18, GN Docket No. 12-354 (filed Aug. 15, 2014) ("2014 AT&T Reply Comments").

⁴² See, e.g., AT&T Comments at 5; Comments of Ericsson at 6, GN Docket No. 12-354 (filed July 24, 2017).

such claims when the Commission first established census-tract licensing, and did not seek reconsideration of those rules on this basis. Even Dr. Vincent, who prepared comments for Verizon, “agree[d] with Professor Paul Milgrom that auctions of license areas that number even as high as 70,000 should be computationally feasible for common auction mechanisms” and that this should therefore not present serious challenges for the Commission.⁴³

This leaves only the putative “administrative burden”⁴⁴ on carriers *themselves*. Carriers’ convenience is a dubious reason for altering the auction rules in a way that excludes every other potential licensee, including IIoT providers, wireless broadband providers, critical infrastructure, schools, and hospitals. Any benefit from slightly reducing the largest carriers’ costs of auction participation would be greatly outweighed by the harms from excluding other bidders—potentially including the would-be highest bidder for a given PAL. As Dr. Lehr explained, excluding bidders in this way runs the risk of “[r]eversing progress on closing the rural broadband divide,” and “[t]hreaten[s] potentially trillions of dollars of benefits to the U.S. economy associated with growth of IIoT applications.”⁴⁵

Furthermore, the magnitude of any administrative burden for the large carriers is likely minimal. Sprint holds more than 30,000 Commission licenses, confirming that carriers are capable of implementing systems to manage such a license portfolio.⁴⁶ Verizon, AT&T, and T-Mobile also certainly possess the technical wherewithal to manage PAL bidding, taking into account possible complexities such as potential complementarity of licenses. The Commission’s

⁴³ Vincent Comments at 6 (emphasis omitted).

⁴⁴ Verizon Comments at 12; *see also* Vincent Comments at 6-7.

⁴⁵ Lehr Comments at 31.

⁴⁶ *See* Letter from Austin C. Schlick, Director, Communications Law, Google LLC, to Marlene H. Dortch, Secretary, FCC, Attachment at 11, GN Docket No. 12-354 (filed Oct. 16, 2017).

rules should encourage bidders to adopt efficient practices, rather than reward the biggest bidders' professed inefficiency by adopting rules that exclude smaller potential bidders from the auction.

Moreover, both Dr. Lehr and Dr. Milgrom discredit the underlying premise that carriers will need to develop and execute complex bidding strategies in the 3.5 GHz PAL auction. Both Dr. Lehr and Dr. Milgrom have concluded that, contrary to carriers' claims, "complementarities . . . play a relatively minor role" in the 3.5 GHz band ⁴⁷—i.e., because 3.5 GHz deployments are likely to leverage backhaul and other infrastructure which can be used to support operations in any number of spectrum bands, the value of one PAL license is relatively independent of whether a licensee also holds adjoining 3.5 GHz PALs. Therefore, from an economic perspective, "[t]here is no need to design the auction to enable bidders to express complex complementary values for 3.5 GHz licenses."⁴⁸

Finally, the Commission should reject "compromise" proposals to offer larger license sizes in urban areas while retaining census-tract licensing in less populated areas.⁴⁹ This splitting of the baby would perversely encourage large carriers to limit their deployments to urban locations where they can obtain PALs of their preferred size. Currently underserved rural communities could be left entirely out of carriers' CBRS deployments. At the same time, this proposal would preclude geographically targeted deployments by diverse entrants such as those

⁴⁷ Milgrom Comments ¶ 17.

⁴⁸ *Id.* See also Lehr Comments at 16 ("[S]mall cells will operate on multiple frequency bands and so will need to be frequency agile. Consequently, their investment in transitioning to small cells will include investments in site leases, arranging for backhaul and other network-related costs and will not depend on their having access to 3.5 GHz spectrum.").

⁴⁹ See Comments of Frontier Communications Corporation, Windstream Services, LLC, and Consolidated Communications, Inc. at 5-10, GN Docket No. 17-258 (filed Dec. 28, 2017).

described above: networks used for broadband connectivity in hospitals, urban and suburban IIoT, private LTE networks, entertainment and other venues, and urban wireless broadband providers, so that even urban areas would realize less benefit than under the current rules.

B. Commenters Overwhelmingly Oppose Ten-Year PAL License Terms with an Expectation of Renewal.

Replacing three-to-six-year PAL terms with ten-year terms and an expectation of renewal would make it unlikely that a PAL license would change hands once granted, except through infrequent and inefficient secondary-market transactions, a proposition which no commenter disputes. Such a rule would thus provide initial auction winners a practically permanent grant of spectrum. This front-loads spectrum acquisition costs for bidders and results in very high barriers to entry (and barriers to exit). The record shows that this structure favors only one group of bidders—the largest wireless carriers—and would disfavor rural wireless broadband providers, IIoT providers, venue operators, and other innovators.⁵⁰

⁵⁰ See, e.g., BPS Networks Comments at 1 (“[I]ncreasing the license term to ten years will drive the cost of the licenses to a level that small providers cannot afford or be able to justify.”); Comments of Cloud Alliance LLC at 2, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Cloud Alliance Comments”) (“[I]ncreasing the PAL term lengths with renewability provisions further increases the likely auction prices and essentially makes terms permanent, effectively eliminating the smaller companies.”); Comments of Future Wireless Technologies of Nebraska at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Future Wireless of Nebraska Comments”) (“The proposal to increase the licensing terms from 3 years to 10 years with a renewal will likely price PAL licenses beyond what is economically feasible for the customer base in those areas.”); Comments of MetaLINK Technologies at 1, GN Docket No. 17-258 (filed Dec. 26, 2017) (“MetaLINK Comments”) (“Our belief is that increasing the license terms will consequently increase the bid price. A higher bid price will exclude those providers that service rural communit[ies].”); Comments of Mimbres Communications, LLC at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (“We would almost certainly be unable to afford such a license, and if we were somehow successful in obtaining one, the build-out requirements to cover such a large area would require us to seek outside capital for what would become a highly speculative business proposition.”); Softcom Internet Comments at 1 (“Longer term, guaranteed renewal licenses will increase the attractiveness to the large cellular companies, thereby driving up the price and make the cost of obtaining a PAL unaffordable to a small company such as ours.”); Verso Networks Comments at 1

Although large carriers have claimed that they need longer license terms to reliably recoup their costs of deployment, they have provided no evidence to support their claims that the initial six-year term provided in the existing rules is insufficient. Furthermore, they have not substantiated their extraordinary claim that potential bidders require essentially *permanent* licenses in order to invest.

T-Mobile is one of the few supporters of permanent terms to provide any explanation at all. According to T-Mobile, license terms should be extended to account for the time needed to “standardiz[e] a new frequency band, develop[] and certify[] equipment, introduc[e] a new band into end-user devices, and deploy[] infrastructure.”⁵¹ Much of the preparatory work, however, is already near completion in the Wireless Innovation Forum, CBRS Alliance, and other industry groups. In fact, as early as August of last year, Mehmet Yavuz, Vice President of Engineering for Qualcomm, noted that he was “encouraged to see multiple live demos using band 48, which is the 3GPP-approved LTE band-class for the CBRS spectrum,”⁵² in addition to Qualcomm demonstrations showcasing “how a private LTE network in the CBRS spectrum can be used for IIoT applications with all the high-performance benefits of using LTE technology.”⁵³

(“These proposals [to lengthen PAL license terms] make it economically infeasible for small companies to make competitive bids at the PAL auction and thus PALs would become almost exclusively the domain of the national mobile carriers.”); Comments of Vivint Wireless, Inc. in Response to the Notice of Proposed Rulemaking at 3, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Vivint Wireless Comments”) (“[A]pplying a conventional ten year term with an expectation of renewal to PALs would discourage new entrant participation in the auction.”).

⁵¹ T-Mobile Comments at 4.

⁵² Mehmet Yavuz, *CBRS Alliance Marches Toward Commercializing LTE in the 3.5 GHz Band*, Qualcomm (Aug. 17, 2017), <https://www.qualcomm.com/news/onq/2017/08/17/cbrs-alliance-commercializing-lte-35-ghz-band>.

⁵³ *Id.*

Moreover, the ability to aggregate successive three-year terms in the initial application window already addresses the concern that the initial tranche of PAL licenses may require more time to commercialize than later grants. Importantly, these rules accomplish this goal without making PAL spectrum inaccessible for all but the largest carriers, and without freezing spectrum assignments into place in the initial PAL auction.

Dr. Lehr has explained that overly long license terms cause significant harm: “The inability to repurpose spectrum resources that were originally allocated with long, effectively perpetual, licenses has been one of the major reasons that spectrum has been under-utilized and used inefficiently in so many bands for so long.”⁵⁴ By contrast, the existing limited-duration PAL rules are “consistent with the goal of transitioning toward more efficient, market-based spectrum management and facilitating more dynamic spectrum sharing. With shorter licenses, spectrum users need to confront market forces more frequently . . . allowing for more frequent resetting of spectrum acquisition costs to reflect market realities.”⁵⁵

Finally, overwhelming opposition to ten-year license terms with renewal expectancy makes clear that the large carriers’ concerns about their ability to recoup their investment under the existing rules are either unique to the largest carriers, or incorrect. Only a small minority of commenters supported the large-carrier proposal, with scores of commenters highlighting that they are already making investments under the existing rules. As Vivint Wireless explains, a three-year term is well matched “for small cell operations where a buildout can occur quite expeditiously and equipment can be amortized within a three-year window.”⁵⁶ Dr. Lehr’s

⁵⁴ Lehr Comments at 13.

⁵⁵ *Id.*

⁵⁶ Vivint Wireless Comments at 3.

analysis confirms this point. As he explains, because the 3.5 GHz band will be used to add capacity to existing networks, 3.5 GHz small cells will often be deployed “in areas where [carriers] already have nearby infrastructure and where they almost certainly have backhaul at desired sites.”⁵⁷ Therefore, the investment required to add 3.5 GHz spectrum to an existing carrier network will, to a large extent, be limited to the cost of the 3.5 GHz radio equipment itself—“[m]ost of the costs of [carriers’ small-cell] investments are associated with physical site costs and are not frequency dependent.”⁵⁸ And “[t]he economic depreciation life of most computing or electronic equipment (including the radios) is likely to be on the order of a few years, and certainly less than the decades-long terms that are the real-world result of ten-year terms with an expectation of renewal.”⁵⁹

The big carriers’ own prior positions support Dr. Lehr’s economic analysis. In 2014, far from claiming that they required effectively perpetual licenses to invest, AT&T and Verizon both supported rules with *shorter* license terms than the three-year terms, with the possibility of a single renewal, that the Commission ultimately adopted.⁶⁰

If, despite all this record evidence to the contrary, the Commission decides to change course and extend license terms, it should do so in a far more targeted way than granting effectively perpetual spectrum rights. Extending license terms to five years with the option of

⁵⁷ Lehr Comments at 15.

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ 2014 AT&T Reply Comments at 17 (“[D]uring the transition period, the Commission should issue PALs with an initial term of three years, with a first renewal of two years. After the original five year license term, PALs should be able to renew for additional one year terms so long as service is being provided in the licensed service area.”); Verizon Comments on Further Notice of Proposed Rulemaking at 13-14, GN Docket No. 12-354 (filed July 14, 2014) (advocating a “transitional framework” for a portion of the band while industry “adapt[ed]” to census-tract licensing with one-year terms).

extension for a second five-year term would address carriers' claims that an initial three- or six-year term is not adequate.

Unlike indefinite renewals, the five- or ten-year approach would resolve carrier concerns without making PAL licenses prohibitively expensive for others. It also would allow future auctions to serve their intended function: allowing spectrum assignments to track changes in their most efficient uses over time. Just a few years ago, for example, the large carriers claimed that 3.5 GHz spectrum is suited only to fixed broadband use.⁶¹ If auctions had been held then, and licenses issued with the expectancy of renewal, then the CBRs spectrum would have been assigned permanently to point-to-point operators. There would be no opportunity for the mobile uses to which the large carriers now claim this spectrum is best suited. As this recent history highlights, the Commission should account for technological progress and allow higher-value uses to take hold through spectrum auctions over time.

C. The Record Makes Clear that Allowing Partitioning and Disaggregation Will Not Solve the Problem of Licenses that Are the Wrong Size or Wrong Duration.

Although the large carriers claim that the Commission can mitigate the harms of enlarging or extending 3.5 GHz PALs by authorizing partitioning and disaggregation, the record makes clear that the secondary market generally fails as a tool for transferring surplus spectrum from large carriers to users with more targeted geographic needs. It operates far more frequently—and far more efficiently—in the opposite direction: allowing large carriers to aggregate spectrum that initially was acquired by smaller operators.

⁶¹ See Comments of AT&T Inc. at 7, ET Docket No. 10-123 (filed Apr. 22, 2011); Comments of CTIA – The Wireless Association at 13, ET Docket No. 10-123 (filed Apr. 22, 2011); Comments of T-Mobile USA, Inc. at 7, ET Docket No. 10-123 (filed Apr. 22, 2011).

This is confirmed on the record by Dr. Lehr's economic analysis, several empirical studies, and numerous comments. According to a survey of Wireless Internet Service Providers Association ("WISPA") members, for example, *90% of wireless broadband providers that have sought to acquire spectrum from carriers on the secondary market have failed*, either because the carrier was unwilling to negotiate, or because it imposed unacceptable conditions on any potential transaction.⁶² Other empirical studies illustrate the same phenomenon. A study by NERA Economic Consulting observed:

[T]rades between large and small operators may be frustrated by high transaction costs or by inertia. For example, larger operators may give very low priority to disaggregating small area licenses, given their small value as a proportion of overall holdings. . . . While there are many examples of larger operators acquiring spectrum from smaller players over the last five years, we understand that there is little recent history of the larger carriers leasing, disaggregating or partitioning large sections of spectrum where they already have service.⁶³

The large carriers' own advocacy group found the same thing: secondary-market transfers *to* large carriers are far more common than transfers from carriers to smaller entities.⁶⁴

Dr. Lehr likewise observed that secondary markets have generally been inefficient and "do not in practice provide companies with geographically smaller spectrum needs with the access they require."⁶⁵ Other record comments confirm these conclusions. As MetaLINK Technologies ("MetaLINK"), a wireless broadband provider, explained:

⁶² Comments of the Wireless Internet Service Providers Association at A-3, GN Docket No. 17-258 (filed Dec. 28, 2017) ("WISPA Comments").

⁶³ Richard Marsden et al., NERA Economic Consulting, *Local and Regional Licensing for the US 600 MHz Band (Incentive Auction)* 18-19 (Jan. 2014) (footnoted omitted), *available at* http://www.nera.com/content/dam/nera/publications/archive2/PUB_NCTA_0114.pdf.

⁶⁴ Mobile Future, *FCC Spectrum Auctions and Secondary Market Policies: An Assessment of the Distribution of Spectrum Resources Under the Spectrum Screen* 18-19 & fig.11 (Nov. 2013), *available at* <http://mobilefuture.org/wp-content/uploads/2013/11/Paper-Distribution-of-Spectrum-Resources.pdf>.

⁶⁵ Lehr Comments at 12.

From our perspective, [reliance on the secondary market] has not worked well in the past. Typically, there is little interest to lease space unless the secondary market bidder is willing to pay an exorbitant amount.⁶⁶

Several wireless broadband providers, and other prospective PAL users, echoed MetaLINK's conclusion that the large carriers have no track record of transferring spectrum to other types of spectrum users. Even a potential large acquirer of CBRs spectrum, Comcast Corporation, noted that

[T]wenty-plus years of auction history has shown that it is much more efficient to aggregate up desired territories in an auction than to sell unneeded portions of a license outside of an auction.

The record in this and other Commission proceedings reveals significant friction and inefficiency in secondary markets, with high transaction costs that often limit the potential for partitioning and disaggregation to result in an ideal allocation of spectrum rights.⁶⁷

Tellingly, the large carriers do not attempt to show that they have ever engaged with any frequency in the kind of secondary-market transactions that they assert would occur following the adoption of PEAs. Verizon's Dr. Vincent, in particular, only provides evidence "to support

⁶⁶ MetaLINK Comments at 2.

⁶⁷ Comments of Comcast Corporation at 13, GN Docket No. 17-258 (filed Dec. 28, 2017); *see also* Amplex Electric Comments at 2 ("Disaggregation and secondary markets are not a solution to the problems the FCC creates by greatly increasing the PAL sizes and extended licensing terms."); Comments of Bernhardt Communications Company at 3, GN Docket No. 17-258 (filed Dec. 26, 2017) ("The likely outcome [of secondary market partitioning and disaggregation], based on history, is that much of the spectrum will not be used effectively and underserved areas will remain under or un-served."); New Wave Net Corp. Comments at 1 ("[Secondary market partitioning and disaggregation] has never worked in the past with the entire nation wide spectrum the mobile carriers have been sitting on in rural areas for the past 10 years!"); Comments of Union Pacific at 10, GN Docket No. 17-258 (filed Dec. 28, 2017) ("[N]othing in the current Commission record supports the presumption that large bidders are likely to make any, let alone a sufficient amount of, excess spectrum available to smaller players on the secondary market."); *see also* Vivint Wireless Comments at 5 (explaining that some PAL licensees will almost certainly choose not to make spectrum in suburban and/or rural areas available on the secondary market, leaving spectrum underutilized).

the existence”⁶⁸ of a secondary market for spectrum, but he makes no attempt to characterize the actual participants in that market.

The record submissions on all sides therefore point to the same conclusion. Although secondary-market transactions provide a relatively efficient means for large carriers to aggregate spectrum when license areas are smaller than they would prefer, large carriers are not likely to allow smaller operators to acquire disaggregated spectrum from holders of large PALs. The Commission therefore cannot reasonably rely on secondary-market transactions to correct for license areas, such as PEAs, that are too large.

D. Prospective Licensees Have Already Invested Millions of Dollars in the 3.5 GHz Band in Reliance on Existing Rules.

The NPRM asked prospective PAL users to detail the investments they have made in reliance on the existing CBRS rules, and how future investment decisions might be altered by changes.⁶⁹ The response on the record is overwhelming, with at least 39 separate commenters detailing the investments they have made, and how that investment will be stranded—and future investments called off—if the Commission expands PAL license areas or makes PAL terms effectively permanent, as the large carriers have requested.⁷⁰ The results of a WISPA member

⁶⁸ Vincent Comments at 2.

⁶⁹ NPRM ¶ 14.

⁷⁰ All Points Broadband Comments at 2 (“All Points has made several hundred thousand dollars in operating and capital investments in reliance on the current rules for the CBRS band.”); DMCI Broadband Comments at 1 (filed Dec. 27, 2017) (“[W]e have invested over \$700k in LTE products that operate in the 3650-3700 with the expectation of additional spectrum from the CBRS decision outlined in 2015.”); HighSpeedLink.net Comments at 1 (“In the past year alone I have invested nearly a half a million dollars in infrastructure upgrades in preparation of using the new CBRS band.”); Comments of Mid-State Services, LLC at 1, GN Docket No. 17-258 (filed Dec. 26, 2017) (“Here at Mid-States we have invested thousands of dollars in infrastructure based off the original rules”); OnlineNW Comments at 2 (“OnlineNW has already invested more than one million dollars in hardware and labor for the 3650-3700 MHz relying on the rules adopted after April of 2015.”); Comments of Rapid Systems, Inc. at 1,

survey reveal that over 60% of WISPA's more than 800 members⁷¹ have purchased equipment and begun serving customers using 3.5 GHz spectrum in reliance on the existing CBRS rules.⁷²

Furthermore, these same providers report that the NPRM itself has already begun to deter their

GN Docket No. 17-258 (filed Dec. 28, 2017) (“Rapid Systems has invested close to a million dollars in hardware and labor for 3650-3700 MHz relying on the rules adopted after April of 2015”); Comments of Resound Networks, LLC at 1, GN Docket No. 17-258 (filed Dec. 29, 2017) (“Resound[’s] 2018 investment of \$4 million dollars was modeled with the CBRS rules that were adopted in April 2015.”); Southern Internet Comments at 1 (“We spent over \$100,000 to build and operate a network based on the Commission’s earlier work on CBRS”); *see also* AirLink Comments at 2 (explaining that it has already made significant investments in CBRS); Comments of Alsat Wireless at 1, GN Docket No. 17-258 (filed Dec. 21, 2017) (“Alsat Wireless Comments”) (same); BDA Wireless Comments at 2 (same); Comments of Byhalia.net, LLC at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (“Byhalia.net Comments”) (same); Cirrinity Wireless Comments at 1 (same); Cloud Alliance Comments at 2 (same); Comments of CMS Internet LLC at 2, GN Docket No. 17-258 (filed Dec. 28, 2017) (same); Comments of COLI, Inc. dba 186networks at 1, GN Docket No. 17-258 (filed Dec. 27, 2017) (same); DSLbyAir Comments at 1 (same); Comments of EBTX Wireless, LLC at 1, GN Docket No. 17-258 (filed Dec. 27, 2017) (“EBTX Comments”) (same); KWISP Internet Comments at 2 (same); Future Wireless of Nebraska Comments at 1 (same); Comments of GigaBeam Networks, LLC at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (“GigaBeam Comments”) (same); Comments of Higher Speed Internet at 1, GN Docket No. 17-258 (filed Dec. 21, 2017) (same); Comments of JAB Wireless, Inc. dba Rise Broadband at 1, GN Docket No. 17-258 (filed Dec. 27, 2017) (“Rise Broadband Comments”) (same); Comments of New Lisbon Broadband and Communications at 1, GN Docket No. 17-258 (filed Dec. 21, 2017) (same); Comments of North Carolina Wireless, LLC at 1, GN Docket No. 17-258 (filed Dec. 26, 2017) (same); Q-Wireless Comments at 1 (same); Rajant Comments at 5 (same); Comments of Ridge Wireless, Inc. at 1, GN Docket No. 17-258 (filed Dec. 28, 2017) (same); Comments of Roller Network LLC at 2, GN Docket No. 17-258 (filed Dec. 28, 2017) (same); Comments of Ruckus Networks, a company of Arris U.S. Holdings, Inc. at 4, GN Docket No. 17-258 (filed Dec. 28, 2017) (same); Smart Way Communications Comments at 1 (same); Softcom Internet Comments at 1 (same); Comments of SonicNet, Inc. at 2, GN Docket No. 17-258 (filed Dec. 28, 2017) (same); Comments of TecInfo Communications at 1, GN Docket No. 17-258 (filed Dec. 29, 2017) (same); Comments of Tennessee Wireless, LLC at 1, GN Docket No. 17-258 (filed Dec. 29, 2017) (same); Junction Internet Comments at 1 (same); Comments of Utilities Technology Council at 4, GN Docket No. 17-258 (filed Dec. 28, 2017) (same); Comments of Wavelinc Communications LLC at 1, GN Docket No. 17-258 (filed Dec. 27, 2017) (same); Comments of Wilderness Wireless at 1, GN Docket No. 17-258 (filed Dec. 27, 2017) (same).

⁷¹ WISPA, *About WISPA*, <http://www.wispa.org/About-Us> (last visited Jan. 29, 2018).

⁷² WISPA Comments at Appendix A, A-1 to A-2.

investment.⁷³ GE also highlighted investments it has made in its most popular IIoT product, which uses 3.65 GHz spectrum for “smart metering, utility substation automation, positive traction control for trains, oil and gas pipeline monitoring, wastewater management, heavy mining, and other forms of IIoT and M2M telemetry.”⁷⁴ As GE explains, such applications require the interference protections of PAL spectrum, which may become inaccessible to GE and its customers if the Commission acts on the large carriers’ most disruptive proposals.⁷⁵

Small businesses will be especially hard hit if the Commission dramatically expands license areas or terms. In fact, the majority of commenters that have already made significant investments, and that stand to lose the benefit of those investments if the Commission makes dramatic changes in order to favor large carriers, are small, entrepreneurial businesses seeking to serve markets that others do not, or that seek to provide service in new and innovative ways. This demonstrates both the unique promise of the 3.5 GHz band and the significant harm that would come from abandoning the animating concept of establishing an “innovation band.”⁷⁶

JAB Wireless, Inc. dba Rise Broadband (“Rise Broadband”), for example, stated that it has invested \$10 million in 3.5 GHz infrastructure in reliance on “the rules set forth in 2015 allowing access to Priority Access Licenses,”⁷⁷ but “to extend auctions to geographic areas the size of Partial Economic Areas (PEAs) on ten year terms with a renewal expectancy essentially takes businesses like ours out of the running for protected spectrum.”⁷⁸ Similarly, GigaBeam

⁷³ *Id.* at Appendix A, A-2.

⁷⁴ GE Comments at 11.

⁷⁵ *Id.* at 25.

⁷⁶ 3.5 GHz Order ¶ 2.

⁷⁷ Rise Broadband Comments at 1-2.

⁷⁸ *Id.* at 2.

Networks (“GigaBeam”), a wireless broadband provider serving rural Virginia, has invested \$200,000 in CBRS-ready equipment—with plans to invest another \$2 million—in reliance on the availability of PAL spectrum at a reasonable cost. However, as GigaBeam explains, “increasing the license term length and PAL sizes to PEA boundaries will make this impossible. [GigaBeam] would have to purchase PALs in 6 different PEA areas and will probably cost millions of dollars.”⁷⁹ These six PEAs cover urban areas across three states, requiring GigaBeam to compete with large carriers for the Huntington, WV, Charleston, WV, Morgantown, WV, Kingsport, TN, Roanoke, VA, Danville, VA, Lynchburg, VA, and Charlottesville, VA markets if PALs were expanded to PEAs, even though GigaBeam’s service is focused on rural areas.

The amounts invested by individual operators like these may seem small from the perspective of a large carrier. But they are very large from the perspective of the small business entrepreneurs and innovators that have made them.⁸⁰ And, in the aggregate, they demonstrate the superiority of the *existing* rules for stimulating investment, which are compatible with these business plans *in addition to* those of the large carriers.

Furthermore, if the Commission chooses to grant the large carriers’ requests to alter the PAL licensing rules and exclude these small investors, it will also irreparably harm its own reputation for stability and sound policymaking. For investors like those behind Junction Internet LLC, who have invested \$100,000 of their \$892,000 in annual revenue in reliance on the 2015

⁷⁹ GigaBeam Comments at 2.

⁸⁰ See, e.g., Alsat Wireless Comments at 1 (“For a company of our size, [\$135,000] is a very substantial investment.”); Byhalia.net Comments at 1 (“This has led to an investment in LTE 3.65 GHz technology, which is a big investment for a small WISP like ourselves”); EBTX Comments at 1 (“For a small company, we have made significant investment into LTE equipment in the 3650-3700 MHz band to serve our rural customer base with high speed internet.”); Junction Internet Comments at 1 (“Since [2015], we have spent over \$100,000 in deploying and utilizing LTE equipment. Our company did \$892,000 revenue last year; so our current investment in 3.5G LTE equipment is substantial.”).

CBRS rules,⁸¹ it may be difficult to imagine making future business decisions in reliance on the Commission's seemingly settled rules.

E. The Commission Should Reject Calls to Wall Off Anonymized SAS Registration Data from Public View.

The large carriers continue to call for the Commission to conceal even anonymized CBSD registration from the public. But they once again fail to provide any concrete justification, and fail to acknowledge that doing so could undermine GAA deployments.

The large carriers claim vaguely that public disclosure of a limited amount of anonymized data under existing rules would compromise the security of their networks, or reveal competitively sensitive information. But they do not explain how revealing the mere existence of a CBSD base station, its transmit power, and certain other technical parameters—not its owner or other proprietary information which are protected by existing rules⁸²—would give rise to such concerns. In fact, carriers do not dispute that such data is already widely available for existing cellular base stations and Wi-Fi deployments and, in some cases, is provided by operators themselves.⁸³ It seems obvious that the carriers do not actually have competitive or security fears about disclosure of basic network information. The effect of their position would only be to

⁸¹ Junction Internet Comments at 1.

⁸² See 47 C.F.R. § 96.55.

⁸³ CellMapper, *T-Mobile USA 4G – LTE Network*, <https://www.cellmapper.net/map?MCC=310&MNC=260&type=LTE&latitude=38.88286208803332&longitude=-77.02798337002793&zoom=18&showTowers=true> (last visited Jan. 29, 2018); Comcast, *XFINITY WiFi Hotspot Finder*, <http://hotspots.wifi.comcast.com> (last visited Jan. 29, 2018); AT&T, *AT&T Wi-Fi Hot Spot Locations*, <https://www.att.com/maps/wifi/basic.html> (last visited Jan. 29, 2018); Optimum, *Find Optimum WiFi Hotspots*, <https://www.optimum.net/internet/hotspots/> (last visited Jan. 29, 2018); Cox Communications, *Find a WiFi Hotspot*, <https://www.cox.com/aboutus/wifi-hotspot-map.html> (last visited Jan. 29, 2018); Spectrum Wifi, *Find WiFi Locations*, <https://www.spectrum.com/wifi-hotspots.html> (last visited Jan. 29, 2018).

impede potential entrants by making it more difficult for them to collect useful data. Verizon virtually says as much when it quips that Google should “compil[e] it itself.”⁸⁴ And while AT&T and Ericsson ask the Commission to conceal registration data from the public, they say that potential providers can “work with a SAS to determine where they can deploy CBSDs on a GAA basis.”⁸⁵ It would be arbitrary and capricious for the Commission to withdraw its existing, efficient process for public access to information the carriers acknowledge will find its way into the public domain. Indeed, the record clearly shows the effect of such a change would be to impede legitimate, pro-competitive access, rather than to protect sensitive information.

Indeed, the record disproves carrier suggestions that access to CBSD data “does not serve any relevant purpose.”⁸⁶ Arbuckle provides a concrete example of the value of this information. As Arbuckle explains, a GAA user will need to know how many contiguous channels are available throughout its service area in order to predict the speeds that it can offer to its subscribers.⁸⁷ The large carriers’ proposal would strip rural broadband providers like Arbuckle of a tool they need to reduce risk in their business and serve their customers effectively. The Commission should support diverse entry into the CBRs service by preserving the existing rules allowing disclosure of basic, anonymized information.

CONCLUSION

The record reveals a number of steps the Commission can take to improve the utility of the 3.5 GHz band for large carriers, while still preserving opportunities for meaningful

⁸⁴ Verizon Comments at 17.

⁸⁵ AT&T Comments at 12-13 (quoting Comments of Ericsson at 8-9, GN Docket No. 12-354 (July 24, 2017)).

⁸⁶ T-Mobile Comments at 13.

⁸⁷ Arbuckle Comments at 3.

participation by cable operators, rural broadband providers, hospitals, utilities, IIoT providers, and many other types of licensees. These changes include altering the existing out-of-band-emissions limits, allowing all seven PALs to be auctioned in each license area, and improving secondary market rules, all of which enjoy widespread support on the record. The Commission should make these changes.

The Commission should not substantially enlarge PAL license areas or lengthen license terms. Expanding license areas to more than 1,000-times the size of a typical small-cell deployment, and making licenses effectively permanent, would gerrymander PALs for large carriers and exclude virtually every other potential bidder. The record also makes it overwhelmingly clear that partitioning of overly large PEA license areas would not be an effective or efficient substitute for license areas that are adaptable to the diverse use cases that potential licensees are developing today. The Commission should therefore preserve its current license size and duration rules.

Respectfully submitted,



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